HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF
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ACTION OF COMMON AND MEDICATED SOAPS AND OF CORROSIVE SUBLIMATE ON THE BACILLUS OF CHOLERA.

IN the *Hygienische Rundschau*, of August 15th, DR. GUNNING, Professor of Hygiene in the University of Amsterdam, gives an account of experiments conducted in his laboratory by Dr. Nijland, of the Dutch East Indian Army, on the action of common and medicated soaps and of corrosive sublimate on the bacillus of cholera diffused in ordinary river water, which appear to involve far wider issues than those which prompted them, viz.: the dangers apprehended from the use for ablution of the water of the river Vecht, in the event of a recurrence of the cholera epidemic at a time when the scarcity of the purer "Dune" ground-water should necessitate its employment for culinary and drinking purposes only. Dr. Nijland used Vecht water, to which were added agar-agar cultures of the bacillus or vibrio of cholera. The general conclusions were that while they soon died out of pure water, the greater the organic pollution present the longer did they retain their vitality and the larger the amount of germicides required for their speedy destruction, such reagents being almost useless in diarrhœal evacuations.

Ordinary soaps dissolved in Vecht water in the proportion of 1.8 per mill. did not destroy them within fifteen minutes, 2.4 parts per mill. being necessary to do so with certainty in ten minutes. So-called disinfecting soaps, containing 3 to 5 per cent. of carbolic acid, salicylic acid, creolin, etc., were no better, if so good. But 2.4 per mill. in a bath of 120 to 150 litres means the consumption of 290 to 360 grammes, whereas the soap commonly used does not exceed 9 to 24 grammes.

But when only 0.12 per mill. of a soap containing 1 per cent. of sublimate was dissolved in water charged with cholera bacilli (2000 to the cubic cm.) no more than 100 were alive after the lapse of one minute, and none at all in five; while 0.006 and even 0.003 of the pure sublimate was sufficient, and the addition of a little salt rendered it still more active.

Dr. Gunning recommends its employment in the form of "pastilles" or tabloids containing 5 mgrs. each, one or two to be used, according to the size of the bath; no possible danger could be incurred by such practice, since the maximum dose for internal administration is as high as 20 mgrs.

For the sterilizing of choleraic or typhoid stools, sublimate is, however, practically useless, from its coagulation of the albuminoid matters in which the bacilli become imbedded and in fact protected.

DIPHTHERIA AND CROUP, AND "DIPHTHERITIC" THROATS.

IN the report of the medical officer of the Local Government Board, DR. KLEIN describes the clinical phenomena and bacteriology of eight cases of ordinary typical diphtheria, "croups" of different forms, and of so-called "scarlatinal diphtheria," illustrating in the most remarkable manner the value of the determination of the presence or absence of Löffler's bacillus as a means of diagnosis. Bretonneau recognized the "false membrane" as essential, in fact as constituting the disease; Virchow divided all cases of pharyngitis and laryngitis into catarrhal, fibrinous, and diphtheritic, and later pathologists have defined his fibrinous exudations as superficial, and his diphtheritic as those infiltrating and inducing more or less necrosis of the mucous and submucous tissues. But all these are differences of degree, not of kind, and apart from the doubt attaching to mild cases of these as of any other diseases, there are at least three sets of problems with which the physician is frequently brought face to face, and which he cannot solve on clinical evidence alone. These are to distinguish—1, the true nature of foul sore-throats, certainly infectious, but with no definite exudation, few, if any, terminating fatally—such cases occurring either alone, or before, during, or after an epidemic of virulent and fatal diphtheria; 2, cases of "scarlatinal diphtheria," *i. e.*, of scarlatina in which all the visible phenomena of diphtheria supervene on those of scarlatina concurrently with or subsequently to the primary disease; and, 3, to differentiate between laryngeal diphtheria and "membranous croup," to say nothing of the catarrhal and spasmodic forms.

Of course, the neuroses or paralytic symptoms are absolutely characteristic of diphtheria, but they are often absent and always appear too late for actual diagnosis.

There can, however, be no longer any doubt that the bacillus of Löffler is the essential cause of diphtheria, that it never occurs in any other disease, and that it will always be found in the true diphtheria, however vague the clinical symptoms, if, and this is no small advantage, only it be looked for early enough. After the third day numerous foreign microbes make their appearance, and may even crowd out the specific one, but *before* that date the exudation may present an absolutely pure and abundant culture.

For the morphology of the bacillus recourse may be had to works on bacteriology, but it is also remarkable for its stability, no very appreciable modification of its form, or diminution of its luxuriance, and none whatever of its virulence being induced even by *acid* broth in cultures carried to the twentieth remove.

Dr. Klein's examination of the scarlatinal cases fully confirmed the conclusions of Babes, Escherich, Holzinger, Wurtz, and others, that, although simultaneous infection with diphtheria and scarlatina is possible, it may be laid down as a rule that diphtheritic symptoms appearing as a sequel to the fever—that is, after one, two, or three weeks—are true diphtheria, and will yield the bacillus in question; but that the like symptoms occurring as a complication, that is, in the course of the fever, are not, and though the streptococcus of scarlatina may be present, Löffler's bacillus will be looked for in vain.

Dr. Klein sums up his conclusions as follows:

1. Membranous croup of the larynx and trachea occurring concurrently with diphtheria of the fauces is *true* diphtheria.
2. The so-called scarlatinal diphtheria is not true diphtheria.
3. Diphtheria of the fauces and membranous croup, following sometimes after scarlatina, are both true diphtheria.
4. Membranous croup of the larynx and trachea, without diphtheria of the fauces, may be of two kinds: *a*, true diphtheria, or *b*, genuine fibrinous croup without the presence of the diphtheria bacillus, and therefore not true diphtheria.

Bretonneau himself had shown long ago, as have Reitz and others since, that a fibrinous *membranous* but not infectious exudation might be produced experimentally by a (chemical) irritant, and there is therefore no reason why it should not have a pathological though not a specific origin.

THE CHEMICAL PATHOLOGY OF DIPHTHERIA.

WHILE Dr. Klein was determining the value of the Klebs-Löffler bacillus in enabling the physician to come to an early and positive diagnosis among doubtful "diphtheritic" and "croupous" cases, DR. SIDNEY MARTIN has been engaged in a study of the chemical products of the bacillus in the human body and in culture fluids, and their physiological actions on rabbits. Beginning with the first, he extracted from the blood and spleen of persons who had died of the several forms of diphtheria, pharyngeal, laryngeal, and nasopharyngeal, by means of alcohol alone, an albumose (deutero-albumose) and an organic acid. The latter is remarkable, since in anthrax, etc., the albumose is associated with an alkaloid. The albumoses (allied to digested peptones) cannot be distinguished from one another by chemical tests, but are easily distinguishable by their physiological actions.

Subcutaneously injected the diphtheritic albumoses gave rise to transient œdema with no tendency to necrosis, and a well-marked rise of temperature, a lesser degree of fever persisting for three or four days; the intensity, duration, etc., of these phenomena, and the termination in recovery or in death, depending, *inter alia*, on the strength and number of the injections.

More striking and characteristic than the pyrexia or the great retardation of the coagulation of the blood were the loss of weight and the muscular paresis identical with the paralytic symptoms so frequently met with in diphtheria.

Careful preparation of the nerves, and especially of the muscular and peripheral branches of those of the hind limbs, of the experimental animals (as well as of some from fatal cases in man) showed conclusively that these symptoms were due to progressive degeneration and atrophy of the axis cylinder, the sheaths being recognizable and intact. The loss of weight was remarkable, amounting in some cases to from one-quarter to one-half of that of the body, even after two injections only. It bore no proportion to the fever, and continued without interruption for a week, or in one case for ten days after the temperature had become perfectly normal, and what was still more surprising, it was not attended with any manifest wasting of the paralyzed muscles.

The organic acid had a similar action, but incomparably larger doses were required.

Roux and Yersin had from artificial cultures of the bacillus and subsequent sterilization of the fluid by passing it through a Pasteur-Chamberland filter, obtained a poison of such virulence that when inhaled and dried 0.0002 gramme was sufficient to kill a rabbit of three kilos in weight. From the fact that such minute doses exerted a prolonged action on the living organism, and that exposure to a temperature of 100° C. destroyed its properties, they rightly concluded that it was a ferment (diastose) which, locally produced by the bacilli, leavened the entire mass of the blood, or, as they express it in one of their papers:

"L'infection n'est produite par un microbe envahissant les tissus, mais par la diffusion dans l'organisme d'une substance toxique, préparée à la surface d'une muqueuse, pour ainsi dire, en dehors du corps."

They, however, in Dr. Martin's opinion, committed an error in using as a culture fluid veal-peptone broth, a medium unlike anything to be found in the living tissues; they thus obtained a product resembling the poison of diphtheria, but artificially intensified. Dr. Martin, on the other hand, used a beef broth containing 1 to 2 per cent. of alkali albumin, but no peptone; in this the bacilli after twenty to thirty days' incubation at 38° C. converted the alkali albumin into albumoses in which small quantities of the organic acid, already referred to, were found. In short, they effected the same changes as are found in the fluids of the body.

Dr. Martin therefore concludes:

1. That the bacillus forms in the diphtheria membrane and in culture fluids products, viz., albumoses and an organic acid identical with those found in the tissues of persons dead from diphtheria.
2. That the physiological actions of single or repeated doses of these products, viz., fever, emaciation, and progressive muscular paresis due to degeneration of the peripheral nerves, are the same as those of the corresponding substances obtained from the tissues, and as the phenomena of the disease itself.
3. That the bacillus is therefore the primary infective agent in diphtheria.
4. That it liberates in the membrane a ferment which when absorbed digests the proteids of the body, forming albumoses and an organic acid.
5. That these are the immediate agents in the production of fever, paralysis, emaciation, and death.
6. That the relatively enormous quantity of these products found in the spleen (in diphtheria as in anthrax) is explicable by the larger proportion of proteids normally present—stagnating, so to say—in the blood of the spleen than in the general circulation.

[P. S. Does not this suggest a search for like secondary pathological poisons in the enlarged spleens of malarial, enteric, and other fevers, including influenza?—E. F. W.]

Disinfection of Letters.

Mr. Washington Lyon (in a letter to the *British Trade Journal*, quoted by *Sanitary Record*, March 1, 1893) gives an interesting proof that steam is admissible for disinfecting letters. All letters written from the Asylums Board Hospital in Kent are passed through the steam disinfector before being mailed. In 1884 there were a thousand smallpox patients at the hospital camps, and the post-office authorities complained that so many of their employés were taken ill with smallpox. Since this method of disinfection was adopted no complaint has been made. Neither the ink, the gum of the envelope, nor the stamp is affected by this process.

ANTAGONISM BETWEEN THE BACILLUS PYOCYANEUS AND THE BACILLUS OF TUBERCULOSIS.

DR. KLEIN, some months before the forced and ill-advised announcement by Prof. Koch of the influence ascribed to certain products of the bacillus of tubercle in inhibiting the progress of tubercular disease, had already tried the effect of frequent injections of the sterilized fluid containing the chemical products of the artificial culture of the bacilli on the course of the disease, induced in animals by inoculation, but with completely negative results.

He then turned his attention to the products of the growth of the bacillus pyocyaneus. Evidence of tuberculosis having appeared in twenty-six guinea-pigs a month after inoculation with cultures from a human tubercular lung, he, on twenty-three successive occasions within about five weeks, injected (*a*) eight with sterilized culture fluid of tubercle bacilli, (*b*) eight with one of bacillus pyocyaneus, and (*c*) eight with a mixture of these, (*d*) the remaining two being retained as control animals. During the following month all died of tuberculosis except five of those that had been inoculated with the bacillus pyocyaneus. They, however, lost flesh and gradually succumbed in the course of the next six weeks. Though far from satisfactory, the results were so far encouraging, they showing that even in the very dilute form which he had employed the pyocyaneal products they had prolonged life, and greatly retarded the progress of the disease. He accordingly next injected eight guinea-pigs with tubercle as before; and on the manifestation of the disease in all, he injected six of them on thirteen consecutive occasions with undiluted broth cultures (sterilized) of bacillus pyocyaneus. The control animals had died of acute tuberculosis before these remedial injections of the others were nearly concluded, in fact within a month of inoculation; and one of those treated died soon after, with, however, far less post-mortem evidence of disease, but the remaining five were all alive and in very fair health and condition two months later, when they were killed for examination. The inguinal glands were found to be enlarged from old inflammatory thickening, but except a few gray points on the livers, and a minute nodule in the lung of one, there were no signs of the tuberculosis which all had manifested after inoculation. The same unequivocal arrest of the disease was observed in another series of four treated in like manner, although unfortunately they, with a number of others, were carried off by an epidemic of pneumonia.

The injections employed with such a degree of success were "three Pravas divisions" of a sterilized broth culture of bacillus pyocyaneus, incubated for ten days at a temperature of 37° C., or that of the human body.